CLAIMS

Therefore the following is claimed:

1   1.   A system for data communication, comprising:

2   a transmitter;

3   a constellation encoder associated with the transmitter, the constellation encoder

4   configured to develop a signal constellation, the signal constellation including a plurality

5   of primary signal points, each of the primary signal points having an associated region,

6   the region representing an error metric within which each primary signal point may be

7   located; and

8   wherein a plurality of secondary signal points are developed by the constellation

9   encoder and located within the region associated with each of the primary signal points.

1   2.   The system of claim 1, further comprising:

2   a receiver configured to receive the signal constellation; and

3   a constellation decoder configured to decode the plurality of primary signal

4   points and the plurality of secondary signal points.

1   3.   The system of claim 2, further comprising a first mapping table

2   associated with the constellation encoder and a first slicing table associated with the

3   constellation decoder, where the first mapping table is used to encode the primary signal

4   points and the first slicing table is used to decode the primary signal points.

1   4.   The system of claim 3, further comprising a second mapping table

2   associated with the encoder and a second slicing table associated with the decoder,

3   where the second mapping table is used to encode the secondary signal points and the

4   second slicing table is used to decode the secondary signal points.

1   5.   The system of claim 1, further comprising a trellis encoder associated

2   with the constellation encoder and configured to trellis encode the secondary signal
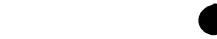
3   points.

1 6. The system of claim 1, further comprising a fractional encoder associated

2 with the constellation encoder and configured to fractionally encode the primary signal

3. points.

1 7. The system of claim 5, further comprising:

2 a receiver configured to receive the signal constellation;

3 a constellation decoder configured to decode the plurality of primary signal

4 points and the plurality of secondary signal points; and

5 . a trellis decoder associated with the constellation decoder and configured to

6 trellis decode the secondary signal points.

1 8. The system of claim 6, further comprising:

2 a receiver configured to receive the signal constellation;

3 a constellation decoder configured to decode the plurality of primary signal

4 points and the plurality of secondary signal points; and

5 a fractional decoder associated with the constellation decoder and configured to

6 fractionally decode the primary signal points.

1 9. The system of claim 1, wherein the plurality of primary signal points are

2 arranged as a circular signal constellation and the plurality of secondary signal points are

3 arranged as a square signal constellation.

1 10. A method for data communication, comprising the steps of:

2 providing a transmit signal to a transmitter;

3 providing a data word to a constellation encoder associated with the transmitter;

4 developing a signal constellation, the signal constellation including a plurality of

5 primary signal points, each of the primary signal points having an associated region, the

6 region representing an error metric within which each primary signal point may be

7 located; and

8 developing a plurality of secondary signal points located within the region

9 associated with each of the primary signal points.

1   11.   The method of claim 10, further comprising the steps of:

2   receiving the signal constellation; and

3   decoding the plurality of primary signal points and the plurality of secondary

4   signal points.

1   12.   The method of claim 11, further comprising the steps of:

2   encoding the primary signal points using a first mapping table; and

3   decoding the primary signal points using a first slicing table.

1   13.   The method of claim 12, further comprising the steps of:

2   encoding the secondary signal points using a second mapping table; and

3   decoding the secondary signal points using a second slicing table.

1   14.   The method of claim 10, further comprising the step of trellis encoding

2   the secondary signal points.

1   15.   The method of claim 10, further comprising the step of fractionally

2   encoding the primary signal points.

1   16.   The method of claim 14, further comprising the steps of:

2   receiving the signal constellation;.

3   decoding the plurality of primary signal points and the plurality of secondary

4   signal points; and

5   trellis decoding the secondary signal points.

1   17.   The method of claim 15, further comprising the steps of:

2   receiving the signal constellation;

3   decoding the plurality of primary signal points and the plurality of secondary

4   signal points; and

5   fractionally decoding the primary signal points.

1   18.   The method of claim 10, further comprising the steps of:

2   arranging the plurality of primary signal points as a circular signal constellation;

3   and

4   arranging the plurality of secondary signal points as a square signal constellation.

1   19.   A system for data communication, comprising:

2   means for providing a transmit signal to a transmitter;

3   means for providing a data word to a constellation encoder associated with the

4   transmitter;

5   means for developing a signal constellation, the signal constellation including a

6   plurality of primary signal points, each of the primary signal points having an associated

7   region, the region representing an error metric within which each primary signal point

8   may be located; and

9   means for developing a plurality of secondary signal points located within the

10   region associated with each of the primary signal points.

1   20.   The system of claim 19, further comprising:

2   means for receiving the signal constellation; and

3   means for decoding the plurality of primary signal points and the plurality of

4   secondary signal points.

1   21.   The system of claim 20, further comprising:

2   means for encoding the primary signal points using a first mapping table; and

3   means for decoding the primary signal points using a first slicing table.

1   22.   The system of claim 21, further comprising:

2   means for encoding the secondary signal points using a second mapping table;

3   and

4   means for decoding the secondary signal points using a second slicing table.

1   23.   The system of claim 19, further comprising means for trellis encoding the

2   secondary signal points.

1   24.   The system of·claim 19, further comprising means for fractionally

2   encoding the primary signal points.

1   25.   The system of claim 23, further comprising:

2   means for receiving the signal constellation;

3   means for decoding the plurality of primary signal points and the plurality of

4   secondary signal points; and

5   means for trellis decoding the secondary signal points.

1   26.   The system of claim 24, further comprising:

2   means for receiving the signal constellation;

3   means for decoding the plurality of primary signal points and the plurality of

4   secondary signal points; and

5   means for fractionally decoding the primary signal points.

1   27.   The system of claim 10, further comprising:

2   means for arranging the plurality of primary signal points as a circular signal

3   constellation; and

4   means for arranging the plurality of secondary signal points as a square signal

5   constellation.

1   28.   A system for data communication, comprising:

2   a transmitter;

3   a constellation encoder associated with the transmitter, the constellation encoder

4   configured to develop a circular signal constellation, the circular signal constellation

5   including a plurality of primary signal points, each of the primary signal points having an

6   associated region, the region representing an error metric within which each primary

7   signal point may be located, the constellation encoder also configured to develop a

8   plurality of secondary signal points arranged as a square signal constellation, the square

9   signal constellation located within the region associated with each of the primary signal

10   points;

11   a receiver; and

12   a constellation decoder associated with the receiver, the constellation decoder

13   configured to decode the circular signal constellation to recover the plurality of primary

14   signal points and the plurality of secondary signal points arranged as a square signal

15   constellation.